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HIGHER EDUCATION SOLUTIONS NETWORK - QUARTERLY REPORT

UNIVERSITY OF CALIFORNIA, BERKELEY
DEVELOPMENT IMPACT LAB (DIL)
AGREEMENT NOS. AID-OAA-A-13-00002, AID-OAA-A-12-00011

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It was prepared by the management team of the Development Impact Lab.

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Acronyms

DevE	Development Engineering
DIL	Development Impact Lab
HESN	Higher Education Solutions Network
ICT	Information and Communication Technologly
IIT-B	Indian Institute of Technology, Bombay
JU	Jadavpur University
LBNL	Lawrence Berkeley National Lab
M&E	Monitoring and Evaluation
MAC	Management Advisory Committee
MAK	Makerere University
MDP	Microgrids Development Project
ODK	Open Data Kit
PAC	Project Advisory Committee
PSU	Portland State University
R&D	Research and Development
RCT	Randomized Controlled Trial
SDS	Sustainable Design Solutions
UC	University of California
UCB	University of California, Berkeley
UCSD	University of California, San Diego
UM	University of Michigan
USAID	United States Agency for International Development
UW	University of Washington
VBTS	Village Base Transceiver Station

Executive Summary

DIL is a partnership between UCB and USAID to foster sustainable, equitable development by linking technological advances (like the design of a solar-powered irrigation system) with rigorous economic evaluation and social innovation. The Lab, part of the HESN initiative, has been in operation for more than two quarters.[1] In this time we have launched several new research projects, developed durable partnerships with USAID, and selected a number of student-led innovations to carry forward. Our efforts are focused on four core objectives:

- Actively managing a portfolio of innovation development solutions with measurable impact
- Building a pipeline of high-potential development innovations
- Enabling development practitioners to use data and analytic tools to inform decision-making
- Fostering an ecosystem in support of development problem-solvers

These objectives contribute to the broader goals of the HESN—either by providing lessons, tools, and platform technologies for USAID's engagement with academia, or by incubating new development solutions that can be scaled by USAID and other partners.

In this report, we highlight some of the exciting achievements from DIL's initial months of operation. We will frequently reference details from an earlier report delivered to USAID in October 2012 and reprinted here (in Appendix 8.1).

Milestones achieved since the earlier report include the formal launch of the Lab at a one-day workshop with consortium partners, the successful implementation of a Big Ideas@Berkeley student competition managed in partnership with USAID, and the evolution of a series of research projects that are blazing a trail in the new field of Development Engineering.

Part 1: Major Milestones and Events Completed

1.1. Milestones

DIL's milestones to date fall within the four objectives:

Objective 1: *Actively manage a portfolio of innovative development solutions with measurable impact.*
Three demonstration projects are currently being supported by SDS to demonstrate the role of interdisciplinary collaboration in creating sustainable development solutions. Each project is outlined in detail in Section 8.1.

Objective 2: *Build an R&D Pipeline of high-potential development innovations.*
To incentivize interdisciplinary groups of researchers to engage in development innovation, we have prepared the initial design for a competition offering pilot research grants to investigators in the DIL consortium.

Objective 3: *Enable development practitioners to use data and analytic tools to inform decision-making.*
We are creating a platform for development data analysis and visualization, named *Mezuri*. The co-investigators involved in the platform's development (at UCB, UW, UM, and PSU) have met in person

[1] The Lab was initially established in FY2012 with the award of a 3-year cooperative agreement to UCB (Agreement No. AID-OAA-A-12-00011, "Sustainable Design Solutions (SDS)," effective June 1, 2012). In FY2013, a second cooperative agreement was issued to expand the Lab's activities and integrate it with the HESN. The latter is a 5-year agreement (No. AID-OAA-A-13-00002, "Development Innovations Lab," effective September 12, 2012). The current report details activities carried out under both agreements, between September 12, 2012 and March 11, 2013. Through this report, the Lab is harmonizing its reporting timelines with those of the broader HESN.

once and have communicated regularly by conference call. Graduate students have been hired by several of the co-investigators at their home institutions. In addition to the *Mezuri* platform, an online database of evaluation techniques and reference materials has been established at http://cega.berkeley.edu/tools/. This initial collection of information by DIL staff, carried out in September 2012, represents a first-pass needs assessment.

Objective 4: *Foster an ecosystem in support of development problem-solvers*.
To foster student engagement in DIL, and to create an ecosystem for development engineering within academia, we have pursued multiple milestones:

- Completion of a Big Ideas@Berkeley competition conducted in partnership with USAID
- Launch of 4 student-led capstone projects, addressing questions posed by USAID
- Progress on the 50 Technologies analysis, including input from multiple USAID stakeholders
- Design of a postdoctoral fellow program
- Initial layout and content development for the DIL website
- Preliminary design of the DevE curriculum and degree requirements

1.2. Events

Since its inception, DIL has sponsored an ongoing seminar series open to all PhD students and faculty at UCB. The series highlights Berkeley students and faculty as well as visiting researchers involved in the design and evaluation of technologies and economic strategies to drive global development. A focus of the seminar is to share field data collection experiences using sensors, sensor networks, metering and fingerprinting technology, as well as mobile devices—all in developing country settings. In HESN's first two quarters, we sponsored two seminars:

Monday Oct 15th – 3:00 to 4:00 pm – 330 Blum Hall
"Design & Impact of Rural Solar Microgrids in India and Kenya," Javier Rosa (PhD student, Computer Science) and Ken Lee (PhD student, Agricultural and Resource Economics) and "Piloting Low-Cost, Village-scale Cell Towers in Papua, Indonesia," Kurtis Heimerl (PhD student, Computer Science) and Kashif Ali (Postdoc, Computer Science)

Monday Dec 10th – 11:30 am to 12:30 pm – 330 Blum Hall
"The challenge of providing safe water with intermittent piped water supply in India," Emily Kumpel and John Erickson (PhD candidates, Civil and Environmental Engineering)

In addition, we held an inaugural workshop for DIL's consortium members, highlighting new techniques for measuring the impact of "development innovations," including randomized trials, wireless sensors, and mobile devices for data collection:

DIL Launch Workshop
Friday March 1st – 9:00 am to 6:00 pm – 100 Blum Hall
All materials from the workshop are available online at http://cega.berkeley.edu/events/dil-launch. Two representatives from USAID attended the meeting to participate in research design discussions and working groups.

1.3. Publications

One of DIL's key deliverables (under Objective 4) is to publish our experiences, research findings, and learnings through a series of white papers and academic publications. Toward this end, a scientific article outlining the principles and theory of DevE was submitted to *Science* magazine in HESN Q2. It was not accepted, however the manuscript either will be released either as a white paper in Q3, or will be

resubmitted to another journal. In addition, the DIL team is working on a white paper for the upcoming event "*Revealing Demand for Pro-Poor Innovations*." This conference will be convened in late 2013, and the white paper will be drafted, peer reviewed, and circulated in advance of the meeting.

Note that the student capstone projects mentioned under Section 1.1 (Objective 4) will also result in formal reports to USAID. These will be appended to the next DIL progress report.

1.4. Communications

DIL's media strategy is still ramping up, but in the meantime we have released a number of informal communications, including one-page project descriptions and event snapshots. More formal releases include the following:

Press Release – UC Berkeley NewsCenter, November 8, 2012
http://newscenter.berkeley.edu/2012/11/08/usaid-gives-20m-for-global-development-initiatives-at-uc-berkeley/

Prepaid Power: Smart microgrids in India – Berkeley Engineer, Fall 2012
http://issuu.com/shawnm/docs/berkeley-engineer-fall-2012/16?mode=window&viewMode=doublePage

Part 2: Description of Key Activities

2.1. Quarter Objectives

Over the first two quarters of HESN, we made rapid progress on the activities proposed in the SDS agreement.[2] All Lab activities are disaggregated by objective in Table 1 (below). The source of support for each activity is also indicated.

Table 1. Proposed Activities by Objective

Objectives	Proposed Activities
1 (Demonstrations)	• Convene an advisory body to support the DIL innovation portfolio (DIL) • Advance the VBTS, MDP, and CellScope research projects (SDS)
2 (Pipeline)	• Establish a Working Group on Incentives for Development Innovation (DIL)
3 (Toolkit)	• Set up for the deployment of a prototype data collection platform (SDS, DIL) • Initiate needs assessment for evaluation toolkit (DIL)
4 (Ecosystem)	• Prepare the Big Ideas toolkit for distribution (SDS) • Launch a Big Ideas@Berkeley competition co-designed by USAID (SDS) • Network with USAID staff, including through student capstone projects (SDS) • Finalize the USAID Staff Exchange program (SDS) • Continue the 50 Technologies analysis (SDS) • Establish the DIL postdoctoral program (DIL) • Launch the DIL Website (SDS, DIL) • Plan the Revealing Demand conference (SDS)

In addition to program objectives, we have defined a set of performance management objectives and activities, which include:

[2] Progress on activities proposed under the second DIL cooperative agreement (No. AID-OAA-A-13-00002) has been slowed due to delays in contracting (and subsequent delays in hiring and sub-contracting).

- Defining an outreach strategy (DIL)
- Appointing and convening the DIL Management Committee and Advisory Board (SDS, DIL)
- Finalizing the M&E strategy, with written guidance to team members (SDS, DIL)

2.2. Summary of Key Activities

2.2.1 Demonstrations

Three demonstration projects were initiated with support from SDS, and detailed descriptions and background materials are available for each project in Appendix 8.1. More recent updates are provided below. One of the key indicators for this activity is the involvement of researchers from multiple disciplines; we demonstrate progress for each project.

Project 1: MDP

- The team has carried out extensive preparation for an RCT of grid connections and grid reliability interventions in partnership with the Kenyan Rural Electrification Authority (REA). This has included field visits to Kenya by multiple student and staff researchers and initial data collection by in-country research partners. The study is now co-funded by a grant from private donors (obtained through a UCB campus competition); the new funding was obtained in Q2 of the HESN initiative, as a result of early seed support from SDS.
- Ongoing refinement of the AC metering design is underway, and we are also developing DC microgrid architecture. Much of this work is carried out at a laboratory on the UCB campus.
- We are preparing for an evaluation of AC microgrids in rural India, with pending USAID DIV support.
- This team includes Profs. Eric Brewer, Edward Miguel, and Catherine Wolfram (UCB) working with Berkeley PhD students Javier Rosa, Achintya Madduri, and Ken Lee. Staff researchers on the project include Matt Podolsky and Carson Christiano at UCB and Francis Meyo in Kenya. There are four disciplines are represented in this project: faculty members in economics, business, computer science, electrical engineering; PhD students in computer science, electrical engineering, and agricultural and resource economics.

Project 2: VBTS

- In the last two quarters, the team has carried out successful deployment of a village base station in Papua, Indonesia, which is serving over 100 customers with SMS and voice connectivity and generating profits of $500/month.
- Currently, we are preparing for expansion within Papua and the Philippines, with pending support through UCB (from a private donor).
- This team includes Profs. Eric Brewer and Tapan Parikh (UCB) working with Berkeley PhD students Kurtis Heimerl and Yahel Ben-David and postdoc Kashif Ali. In addition, staff researcher Matt Podolsky has supervised an undergraduate student and a graduate student collaborator from the University of Toronto (Jacob Nerenberg), who are both contributing to the project. The team includes 3 disciplines: faculty members in computer science, information; PhD students from computer science, ethnography, and information.

Project 3: CellScope

- In early 2013, Prof. Dan Fletcher and UCB CellScope Team Member Arunan Skandarajah traveled to India to meet with industry and hospital collaborators in India and discuss a CellScope-based integrated diagnosis workflow for a possible evaluation in India.
- An ongoing tuberculosis (TB) diagnosis trial is being carried out in collaboration with the Vietnam Ministry of Health. At UCB, progress is being made towards development of a novel

automated, cellular phone-based device for TB. A new phone-based system is under development. To automate image analysis, the team is developing and training an algorithm to provide a quantitative measure of TB infection.

- There are more than 4 disciplines represented in this project: faculty members in bioengineering, computer science and medicine and students from bioengineering, biophysics, translational medicine, and political science.

An additional set of demonstration projects will be selected and announced in Q3 or Q4 of the HESN initiative. The full collection of projects will then be reviewed by a Project Advisory Committee (PAC) convened in Q4; this group will provide technical feedback and support to improve progress and outcomes.

2.2.2 Pipeline

DIL's series of incentives for development innovation have been slow to launch, because the staff position supporting this activity could not be hired (due to delays in contracting). Progress is expected to accelerate in HESN Q3. With the staff member in place, we will implement an initial research competition, convene a Working Group on Incentives for Development Innovation (to guide future such competitions), and issue awards for 6-10 new pilot research projects.

2.2.3 Toolkit

Work has proceeded on the Mezuri data toolkit in the areas of needs assessment, design architecture, and refinement and integration of our existing technologies. With financial assistance from CEGA, members from all 3 of the Mezuri development partner institutions (UW, PSU, and Michigan) were able to attend the DIL Launch Conference in March. At this gathering the team shared details of core technologies (such as ODK and SWEETSense) and began discussions on both the architecture of the Mezuri platform and co-deployment opportunities of our technologies.

We also solicited input from the diverse audience that included social scientists, development economists, and USAID OST data team members. Post-launch, we have continued to perform needs gathering, created a working design document, and planned to integrate ODK survey- and sensor-gathering technologies in the UCB Kenyan MDP beginning in HESN Q3. In addition, the final needs assessment for the database of evaluation techniques will be completed and delivered in report format by Q4 of the HESN.

2.2.4 Ecosystem

DIL has invested heavily in creating an ecosystem for development innovation, including opportunities for student training, entrepreneurship, and communication. We have also created tools for outreach to new kinds of partners (including private sector start-ups, large companies, social ventures, and foundations).

Big Ideas@Berkeley Competition

One of our signature activities is the student innovation competition, Big Ideas@Berkeley. The 2012-13 competition launched in August 2012 when over 160 teams—representing more than 500 students, from 75 majors, and 5 UC campuses—submitted pre-proposals. After a preliminary review, 54 teams across 9 categories were selected to compete in the final round. (A full list of the categories can be found on the Big Ideas@Berkeley website here: http://bigideas.berkeley.edu/)

Finalists were paired with mentors and given two months to fine tune their proposals. Final applications were received on March 12, 2013. The pre-proposal and final proposal judges' review period involved

three USAID representatives (Karen Clune, Maurice Kent, Marion Adeney). Ultimately 37 proposals were selected for awards totaling nearly $225,000.

In addition, on April 25th Big Ideas@Berkeley held its 2nd annual "Grand Prize Pitch" day. Two representatives of USAID, David Ferguson and Marion Adeney, were in attendance and participated as judges in the Global Impact Pitch Round. Six of the top teams from this years' competition competed in two categories (Global Impact & Campus and Community Impact) for a total of $18,000 in funding (split between the teams). Prior to the event a luncheon was arranged for the USAID judges which allowed them to meet and brainstorm with several other award winning Big Ideas teams.

Two of this year's Big Ideas categories were inspired by USAID Grand Challenges:

- Promoting Human Rights: This contest sought innovative ideas addressing the causes or consequences of corruption and/or promoting the protection of individuals' essential human rights. This category was inspired by the USAID "Atrocity Prevention" Grand Challenge. It was developed with support and guidance from experts at USAID and UCB faculty with the Human Rights Center and Data & Democracy Initiative at UCB. Nine proposals were initially received in this category, 4 of which obtained some level of funding.
- Maternal & Child Health: The competition sought innovative solutions to safeguard the health of expectant mothers and young children. This category was inspired by USAID's "Saving Lives at Birth" Grand Challenge. It was developed with support and guidance from experts at USAID, Berkeley faculty in the School of Public Health, and the Bixby Center for Population, Health & Sustainability. Ten proposals were initially received in this category, 3 of which obtained some level of funding to enable project implementation.

All of these contests were developed with support (financial and advisory) from departments across the UCB campus. Going forward we plan to work with USAID teams to develop new Big Ideas categories that intersect with Grand Challenge topics.

Of note, this year Big Ideas has completed surveys, discussions and focus groups with Big Ideas participants from 2012 and 2011. We have also conducted research to understand the landscape, both locally and nationally, of services available to budding entrepreneurs and innovators. Through these surveys and research we have discovered a strong need and demand for a post-competition support program. Though many accelerator and incubator services exist for established, investor-ready social ventures, very few tap into the promise and energy harnessed by the early-stage ventures that originate within Big Ideas.

At the time of our survey, 39% of students who had participated in Big Ideas 2011-2012 were still working on their innovations. Further, 55% of the initiatives were still ongoing, independent of whether the respondents themselves were still involved. In all, 30% of teams had gone on to receive additional funding. While these numbers are encouraging, our student surveys and focus groups also strongly suggest that we could further increase the number of teams that continue, as well as the momentum of individuals receiving awards. Indeed, for 68% of Big Ideas participants, it is their first entrepreneurship competition. Many have little prior project leadership or implementation experience. Adding post-competition support—specifically focused on offering services to support very early stage ventures—will improve students' ability to move beyond the prize-stage of their idea.
Over the next 6 months the Big Ideas program will develop a post-award model for supporting these type of team projects, thus ensuring the development of early stage innovators, entrepreneurs and their inspiring projects

Big Ideas Toolkit

As mentioned in our previous update to USAID, we have furthered the development of a Big Ideas Toolkit (formerly "Big Ideas in a Box") that outlines lessons learned in implementing the contest. The Big Ideas model empowers students to create social change; and in an effort to assist other campuses in harnessing the power of student innovation, we plan to share our replicable model. The toolkit provides a roadmap for other campuses within the HESN network to follow.

Toward this end, over the past 6 months we have been systematically archiving and recording all of the key "lessons learned" (best-practices), logistics and materials that go into coordinating a large-scale, multi-disciplinary student innovation competition. Over the next 6 months, we will package this information and supporting materials, with the intention of developing a roadmap that can be used by other universities, most notably those in the HESN network. We have also begun conversations with William & Mary and UCSD to better understand how we might roll this resource out to other campuses in the most useful and translatable way. We intend to engage more university partners in this discussion over the Summer and Fall as we hone the toolkit into a final product.

Student Capstone Projects

A number of faculty mentored graduate students have been working on research and policy analysis projects for USAID clients. These are outlined in Table 2, below. Each project is led by one or more Masters students, with a PhD student and staff researcher providing additional guidance. These projects have progressed rapidly over the last six months, with final reports expected from each student in the next month.

Table 2. Student Opportunities

Office	USAID Contact	DIL Student	Topic
USAID Colombia	Corina Warfield and others	Ashley Clark	Inclusion of underrepresented and marginalized groups in ongoing peace processes, with a focus on technology options that can leveraged by USAID.
USAID Mozambique	Mindy Hernandez and others	Evan Axelrad, Van Nguyen, Nicholas Adams, Satoru Yasuraoka	Analysis of energy solution options for charing of cellphones in rural areas of Mozambique, tying in to a specific USAID-supported initiative.
USAID IDEA/DIV	Duc Tran	Sarah Salter	[non-disclosure agreement with DIV]
USAID IDEA/DIV	Norma Altshuler	Charlotte Jourdain	[non-disclosure agreement with DIV]

Part 3: Intra-Development Lab/ University Engagement

3.1. Interdisciplinary Collaboration

DIL draws faculty from more than 13 departments and colleges on the Berkeley campus; it is led by a mix of computer scientists, environmental engineers, economists, urban studies scholars, and health researchers. The network covers many disciplines, and our activities (like seminars, workshops, and research projects) are all designed to create new opportunities for interdisciplinary collaboration. Even beyond the Berkeley campus, partner institutions like UM and UCSD are making new connections between engineers and social scientists, as a result of involvement in DIL.

3.2. Partner Engagement

Over the last two quarters, DIL staff members have met one-on-one with representatives of several partner organizations, to solidify plans for collaboration and identify next steps. These meetings were with the Aga Khan Foundation, IDEO.org, Intel, the Lemelson Foundation, and IPA. Each partner now has a specific strategy for engagement in DIL. We will continue these small, bilateral meetings with the remaining DIL partners.

3.3. Student Engagement

Graduate Students Working on Capstone Projects

- Evan Axelrad: MPP Candidate, Goldman School of Public Policy (GSPP)
- Van Nguyen, MPP Candidate, Goldman School of Public Policy (GSPP)
- Nicholas Adams, MPP Candidate, Goldman School of Public Policy (GSPP)
- Satoru Yasuraoka, MPP Candidate, Goldman School of Public Policy (GSPP)
- Sarah Salter, MPP Candidate, Goldman School of Public Policy (GSPP)
- Charlotte Jourdain, MPP Candidate, Goldman School of Public Policy (GSPP)
- Tammy Guo, MPP Program, Haas School of Business/GPP
- Priya Mehta, MBA Program, Haas School of Business
- Erica Schlesinger: PhD Program, College of Engineering, Bioengineering

Trainees Involved in Demonstration Projects

- Kashif Ali, PhD, Postdoctoral Fellow in Computer Science
- Yahel Ben-David, PhD Program, Computer Science
- Nader Behdin, Undergraduate, Computer Science
- Kurtis Heimerl, PhD Program, Computer Science
- Kenneth Lee, PhD Program, Agriculture and Resource Economics
- Achintya Maddhuri, PhD Program, Computer Science
- Meena Natarajan, PhD Program, School of Information
- Javier Rosa, PhD Program, Computer Science
- Arunan Skandarajah, PhD Program, Bioengineering

3.4. Lessons Learned/ Good Practices

We have decided to convene the DIL Management Advisory Committee (MAC) on a monthly basis. This group is comprised of the two Lab Directors, Gadgil and Sastry, plus the two Staff Directors, McCormick and Madon. In addition, the five UCB-based academic leads (Gadgil, Sastry, Brewer, Miguel, Roy) will convene quarterly to share updates, discuss deviations from the Work Plan, and report on new opportunities. USAID staff will be invited to join these quarterly meetings in future, to provide feedback and ask questions.

Part 4: USAID Engagement

4.1. Interactions

Office	Date	USAID Contact	DIL Contact	Purpose & Follow-up
USAID Colombia	9/2012	Gomez, Paulo (BOGOTA/PRO)	Nilsson	In-person meeting re: DIL/Blum + USAID Colombia overviews. Resulted in MA student project.
USAID Indonesia	9/2012	Doyle, Mark (Jakarta/EDU), Douraghy, Ali (PPL/ST)	DIL Management Team	Call re: DIL demonstration project (VBTS). Resulted in private sector linkages, networking.
USAID Mozambique	12/2012	Hernandez, Mindy	Podolsky, Rosa, Nilsson, more	Call to get university input on energy solution options. Resulted in MA student project.
USAID India	1/2013	Desai, Sheila	Gadgil	Meeting re: HESN, DIL, specific technologies. Resulted in USAID Fellows program.
USAID DIV	12/2012	Altshuler, Norma (IDEA/DIV)	Nilsson, McCormick	Meetings re: DIV, DIL collaboration. Resulted in MA student project.
Global Water Coordinator	1/2013	Holmes, Chris (E3/AA)	DIL Management Team, Buluswar, Addy, Kornbluth	Call re: breakthrough techs, bottlenecks, AID goals. Outcome TBD.
Global Broadband Initiative	9/2012	Owen, Darrel (GBI) Senior ICT advisor	Podolsky	Calls re: MDP demonstration project. Outcome TBD.
USAID E3/Education	1/2013	Bloome, Anthony (USAID/E3/Education)	McCormick, Maryanne and Murphy-Graham, Erin	Meeting re: All Children Reading Grand Challenge. Outcome TBD.
USAID E3/Energy	11/2012	Lawaetz, Simone and Foster, Jeremy (E3/E&I/E)	Madon, Podolsky, Rosa	Call re: MDP demonstration project. Resulted in networking, info exchange.
USAID Kenya	2/2013	Meassick, Mark and Jones, Michael	Christiano, Carson	Meeting re: MDP demonstration project. Outcome TBD.
USAID Kenya	2/2013	Lee, Dwaine	Christiano, Carson	Meeting re: MDP demonstration project. Outcome TBD.

4.2. Lessons Learned/ Good Practices

TBD.

Part 5: Collaboration with Other Development Labs

5.1. Interactions

MIT-CISE: PIs Gadgil and Sanyal met at MIT to discuss collaboration on the DevE curriculum. Sanyal plans to visit Berkeley in FY2013 to co-develop teaching modules. A joint Berkeley-MIT curriculum could be more powerful than either university acting alone.

Duke: Drs. Nilsson and Satchel attended the Duke launch (technically held in HESN Q3).

5.2. Lessons Learned/ Good Practices

TBD.

Part 6: Monitoring & Evaluation

6.1. Preparation Activities

DIL is in the process of preparing an M&E framework. We developed an initial framework that differed considerably from that endorsed by USAID. Therefore, we have restarted using new templates provided by our AOR. Note that we have decided that the academic leads for each of DIL's 4 objectives will deliver a progress report to DIL management every two months. These reports will include notes from each sub-grantee involved in the objective.

6.2. Ongoing Monitoring & Evaluation

At this point, there are no formal M&E indicators to report on.

Part 7: Looking Ahead

7.1. Calendar of Events

MARCH 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	**Development Lab Collaboration**
Mar 1, 2013	DIL Launch Workshop	Convening of DIL Consortium partners for technical discussions	Activity Managers, Data Team	N/A
APRIL 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	**Development Lab Collaboration**
Apr 1-3, 2013	Lab Directors Meeting	Convening of HESN Lab Directors	Extensive involvement	Extensive
MAY 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	**Development Lab Collaboration**
JUNE 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	**Development Lab Collaboration**
TBD	Field travel	Travel related to demonstration projects	TBD	TBD
JULY 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	**Development Lab Collaboration**
TBD	Field travel	Travel related to demonstration projects	TBD	TBD
AUGUST 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	
TBD	Field travel	Travel related to demonstration projects	TBD	TBD

SEPTEMBER 2013				
DATES	**EVENT**	**DESCRIPTION**	**USAID Leadership/ Involvement**	
Sep 16-17, 2013	Mobile Money Meeting	Conference supported by Gates Foundation, co-sponsored by DIL, on new technologies for pro-poor mobile financial services	USAID guests invited	TBD

7.2. Description of Future Activities

USAID input will be required in the coming months to help us refine our M&E strategy. In addition, we anticipate drawing on USAID expertise as we fund new demonstration projects.

7.2.1. Milestones

In HESN Q3, we expect to achieve the following milestones:

- Select and fund additional demonstration projects
- Draft a first version of the White Paper on Innovation Incentives and create an evaluation strategy for DIL's incentive programs
- Evaluate options for the Mezuri platform infrastructure and inventory existing data sets for platform testing
- Implement the USAID Staff Exchange program, including evaluation
- Begin disseminating the Big Ideas Toolkit outside UCB
- Compete out the postdoctoral fellowship
- Issue at least one DIL white paper
- Finalize the DIL M&E strategy, outreach plan, and other management "infrastructure"

7.2.2. Events

Planned events in HESN Q3 will include:

Friday, April 12, 2013, 12:00-1:00pm @ Blum Hall, B100 Plaza Level
"Black Powder, Red Soil, More Crops: Biochar, technology adoption, and carbon sequestration in Western Kenya"
Andrew Crane-Droesch (PhD student, Energy and Resources Group, UCB)

Wednesday, April 17, 2013, 12:00-1:00pm @ Blum Hall, B100 Plaza Level
"Technology Adoption in Difficult Environments: Evidence from mobile payments in Afghanistan"
Tarek Ghani (PhD student, Business, UCB)

Monday, April 22, 2013, 12:00-1:00pm @ 201 South Hall
"Building and managing low cost, low power wireless networks in developing regions"
Bhaskaran Raman, PhD (Associate Professor, Department of Computer Science and Engineering, IIT Bombay)

Thursday, May 9, 2013, 12:00-1:00pm @ Blum Hall, B100 Plaza Level
"Addressing the Water Energy Nexus in Rural Mountains: A remote sensing feasibility assessment of in-line hydropower"
Marc Muller (PhD student, Civil & Environmental Engineering, UCB)

Monday, May 13, 2013, 2:00-3:00 pm @ Blum Hall, B100 Plaza Level
"Low-cost automated chlorine dosers in urban Dhaka, Bangladesh: balancing tech development, rigorous evaluation, and financial sustainability"
Amy Pickering, PhD and Yoshika Crider (Civil & Environmental Engineering, UCB)

7.2.3. Publications

At least one white paper from DIL will be released in HESN Q3. In addition, several student capstone reports will be delivered to USAID by the end of the Spring semester (which, for Berkeley, occurs in mid-May each year).

7.2.4. Communications

No specific press releases are planned at this time. However, we anticipate that news articles will be published, describing research by DIL investigators.

Part 8: Appendix

8.1. SDS 6-Month Status Update

Sustainable Design Solutions Cooperative Agreement

6-Month Status Update for the USAID Science and Technology Office

Blum Center for Developing Economies

University of California Berkeley

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Report Summary

The Blum Center for Developing Economies leverages the resources of UC Berkeley and its partners to innovate new technologies, services, business models and impact assessments for poverty alleviations.

To this end, the Center has partnered with USAID to establish the Sustainability in Development Solutions (SDS) cooperative agreement. The SDS workplan focuses on 1) Identifying how the University Community, including HESN, can support USAID efforts, 2) Illuminating better practices for revealing demand and improving technology adoption, in part by improving data collection in field settings, and 3) Supporting and scaling student and faculty innovation. These efforts combine a focus on the development of a rigorous methodology for specific, measurable impact outcomes with the establishment of a rigorous set of tools, platforms and abstracted lessons that can support the emerging HESN initiative. To further these goals, we have launched a number of specific initiatives over the first 6-months of the cooperative agreement, including:

Innovation Pipeline. Three pilot research projects are currently being supported by SDS to demonstrate the role of interdisciplinary collaboration in creating sustainable development solutions. A *Village Base Station* study is scheduled to deploy later this year in Indonesia, through collaboration of experts in computer science, sociology, and human-user interface design. The methodological lessons to be learned here are about the methods and pricing models for rapid installation of ICT infrastructures in underserved regions with a pay as you go model without a substantial up front cost. *CellScope* microscopes are currently being used to diagnose tuberculosis in 15 point-of-care clinics in Vietnam, with on-location support, monitoring and evaluation by two full-time staff The project examines technology uptake and effects on diagnosis-rates and subsequent clinical outcomes after introduction of the CellScope in clinics with little previous IT or diagnostic capability. The *Microgrids Development Project* is planning pilot technology evaluations in Kenya and India, and has built relationships with local companies and research implementation partners over the last six months. This is another instantiation of the pay as you go philosophy for establishing energy (electricity) infrastructures for regions without large upfront connection costs. Simultaneously, we are abstracting lessons from the specific projects for an upcoming HESN White Paper Series and Revealing Demand Conference.

Interactions with Missions and Technical Staff. Together with the USAID S&T Office, the Blum Center has reached out to 4 USAID Missions (Vietnam, Colombia, Indonesia, Mozambique) to explore how University projects can best directly interact in-country with USAID and its local partners. In addition, we are evaluating how students could directly support Missions. A series of 1-pagers and recommendations are being prepared that can be used for future integration of HESN members with Mission objectives.

50 Technologies. The core objective of this initiative is to coalesce and catalyze the global ecosystem of science & technology innovators to alleviate global poverty by identifying and analyzing pathways towards technology-based breakthroughs. The team has begun literature research and expert interviews (46 to date) to explore eight core thematic areas. The outcomes of this effort can help USAID and funding agencies identify promising new technology areas for poverty alleviation. We have had some very important discussions on the role of bottom-up needs

assessment to identify the 50 technologies as contrasted with solutions like wireless, empowerment of women, solar LEDs, novel cook-stoves which are more cross-cutting.

Big Ideas@Berkeley. This annual innovation contest is currently underway and provides funding and support to students who have creative solutions to challenges facing our campus, community or world. This year, we have two new categories developed together with USAID and inspired by the agency's Grand Challenges initiative. We are currently working to create a Big Ideas roadmap and toolkit that can be used by other universities, most notably those in the HESN network.

The rapid progress on the above initial set of core focus areas has been possible because of a system of monitoring & evaluation and close interaction between faculty, Blum Center staff, students, and the USAID S&T Office.

Development and Field Testing of Projects in the Innovation Pipeline

The coordinated evaluation of multiple pilot technologies is helping the SDS team build a systematic understanding of the iterative design, and the value of integrating social science research into the process of technology development. Currently, we are working to deploy and evaluate the two cases outlined in the original proposal: Village Base Stations and Wireless Microgrids. A third case, CellScope, was added to our portfolio as it is in pilot deployment and has great potential for impact. Our progress and next steps for each test case are detailed below.

Village Base Station (VBTS) Wireless Project

Project Overview. The Village Base [Transceiver] Station (VBTS), a GSM cellular tower designed for low-density rural areas, is a potentially transformative technology developed by Eric Brewer's research group, *Technology and Infrastructure for Emerging Regions* (TIER). VBTS reduces the cost of a cellular installation, enabling locally owned cellular systems to operate in areas with limited power or network infrastructure. The infrastructure targets communities that traditional multinational telecommunication firms are unwilling to serve, for lack of adequate profit motive.

Keystone Updates and Lessons Learned. Significant progress has been made on both of VBTS's two main components – power and community networking. While traditional power systems provide *always-on* coverage, broadcasting as long as power is available, VBTS provides *virtual coverage* that is available on-demand through software modifications to the tower (which powers up for incoming calls to the village) and development of inexpensive *wakeup radio devices* (which switch on the power when calls are initiated from the village).

Over the past six months, the VBTS team has developed and tested both modifications and found they add around thirty seconds of latency to a call setup, while saving ~85% of the power while the tower is idle. This dramatically reduces power requirements for rural telephony and potentially enables coverage for previously untouched populations. The overall wakeup technology was evaluated using cellular logs from East Africa and South Asia, and this analysis was submitted to NSDI in September.

The team has also hooked into OpenBTS's configuration and runtime and made them available to developers. Using these tools, we have built a new number provisioning system that catches all unprovisioned handsets and forwards them to an interactive voice response (IVR) system.

Within the last six months, TIER EECS graduate student Kurtis Heimerl visited Papua, Indonesia to investigate potential partnerships for experimental deployments of the village base station. This trip was largely positive, as we identified excellent deployment sites and on-the-ground partners, and we plan on returning in late October for a three-month VBTS pilot deployed in a few villages near the town of Wamena.

Additionally, we successfully deployed 5 BTSs at a major outdoor event in rural Nevada, registering over 1000 users in a day and a half of open registration. Our system handled over 7000 calls and 3000 SMS. We facilitated internal communications at the event as well, with interviews indicating numerous instances of pairs registering their phones together to communicate. We also tested our technology and identified numerous bugs that are currently under active development.

Future. The next steps of the project primarily involve deployments of both power and community networking technologies. After our successful scouting trip, Heimerl and EECS postdoctoral fellow Kashif Ali plan to return to Indonesia in the fall to complete a longer-term deployment in the area. They will be joined by Meena Natarajan, a sociologist in the School of Information who will assist in the design of mobile applications for community use; these will be designed and coded over the next six months.

The Papua deployment process has already begun, with the purchase of three BTS installations from Range Networks. We have also submitted our wake-up radios for fabrication. With these, we will deploy in a set of small villages currently two hours outside of commercial cellular coverage. We hope to use our community networking system to support the community as well as local missionary groups and schools. As part of our deployment we will monitor, measure, and evaluate the value of the systems to the villagers in the area. The primary metrics to be evaluated are power savings, uptake amongst population, user satisfaction with the system, and self-reported impact on the community.

Of note, we spoke by phone with the USAID mission in Indonesia, which linked us with other UC researchers funded by the agency. These contacts helped us identify channels for importing equipment into the country. In addition, at the recommendation of mission staff, we have connected with a cabinet-level telecommunications executive in the Indonesia Office of the Prime Minister, who has expressed interest in a partnership to bring rural broadband coverage to island habitations. We have also been in discussions with leaders of the USAID Global Broadband Initiative about opportunities for collaboration and hope that these will lead to tangible next steps in the coming quarter.

Microgrids (uGrids) Project

Project Overview. The Microgrids Development Project (MDP) has made significant progress

towards launching pilot evaluations of solar-powered AC microgrids in two sites: rural Western Kenya (Kisii District, Nyanza Province) and rural Rajasthan, India. The MDP team has built relationships with two local partners (Gram Power in India, and PowerHive in Kenya) as well as survey research partners (Innovations for Poverty Action in Kenya, and J-PAL South Asia in India). In preparation for rolling out pilots in both sites, the research team has applied for human subjects approval from institutional review boards (IRBs) at UC Berkeley and relevant boards in our study sites.

Keystone Updates and Lessons Learned. The MDP is a highly interdisciplinary project: the engineering design team has worked extensively with Berkeley economists on the design of a rigorous impact evaluation as well as a series of pricing experiments to estimate the demand of electricity by households. The team has also worked closely with two startups, Gram Power and PowerHive, on feasibility analyses and the design of experimental microgrid deployments (including planning, budgeting, purchasing hardware, and negotiating cost-share). Together we have ruled out an initial study design that would have retrofitted 83 existing Microgrids in Rajasthan; this proved infeasible due to political concerns, logistics and cost. Instead, we are exploring an evaluation of "greenfield" microgrid sites in a number of off-grid hamlets in rural Rajasthan.

An economics PhD student, Ken Lee, traveled to Kenya and India over the summer to conduct focus groups and household surveys in a small number of communities. These data were used to assess the feasibility of microgrid installation and to generate a preliminary understanding of energy demand, use, and potential impacts in the study areas (including income generation, women's time use, and educational outcomes). Subsequently, we have developed a comprehensive household survey for use during pilot experiments, which should commence in Kenya in late October, and in India in early January 2013.

A central challenge to deploying a microgrid in developing regions is finding metering hardware capable of efficiently and frequently measuring small loads. Off the shelf equipment is too expensive and not tailored towards this particular need. To address this we have developed and extensively tested sophisticated metering hardware appropriate for microgrid deployments and it is currently being used and deployed for us by our local partner in Kenya, PowerHive. A paper on our innovative Microgrid Metering System was submitted and accepted to IEEE GHTC. Importantly, this technology will enable us to transparently gather data from grids deployed in an emerging region, which is key to understanding the impact of electrification on the local economy and its real value to villagers.

Future Work. In India, we plan to deploy a single experimental microgrid in January 2013, using smart metering technology to evaluate patterns of energy use and theft. The experimental grid is unique from others in the Gram Power portfolio, in that we will be able to manipulate prices to generate a product demand curve. In Kenya, we will also deploy a single experimental microgrid connecting up to 20 households, and we will evaluate energy use over a nine-month period beginning in October. EECS PhD student Javier Rosa will travel to Kenya during this time to troubleshoot the metering technology as required, and explore design improvements based on preliminary feedback.

Of note, we are already collecting data from our partners about how existing non-experimental microgrids are being used. We are increasing the communications capabilities of these systems and developing additional functionality, which will increase the quality of service provided by the microgrids. Ultimately, we want to test whether the aggregate data stream collected by the house meter can be disaggregated to provide information about which appliances are being used by households, and when. These data will also inform the development of a predictive model of user behavior, to inform the development of mechanisms for independent management of energy usage. We are now beginning to design a next generation, distributed-storage, DC-based grid capable of using these model predictions; we expect this initiative to heavily leverage the field experiences from our AC microgrid deployments.

CellScope: Smart-phone microscopy for rural disease diagnosis

Project Overview. The Fletcher Group at UC Berkeley is designing a series of mobile phone-based digital microscopy platforms that have the potential to overcome barriers to medical diagnosis in rural point-of-care clinics. Current in-field CellScope evaluation focuses on tuberculosis diagnosis, but novel CellScope platforms are being designed and evaluated for ocular, ear & skin disorders, infectious diseases, and agricultural crop plights as well.

Point-of-care health care worker in clinic, with CellScope, UCB-provided computer, and educational flyers about the CellScope program.

Keystone Updates and Lessons Learned. Working with medical doctors at USCF and the Vietnam National Tuberculosis Program, and building on a smaller scale test-training from October 2011, the Fletcher Lab is currently conducting a 1-year device evaluation of CellScope at point-of-care clinics in Hanoi Province, Vietnam. As part of this study, the team is determining the effect of bringing diagnosis capabilities closer to the patient on TB detection and treatment rates. In addition, the team is evaluating the uptake of novel diagnostics technology in clinics with little previous medical or IT infrastructure, lessons that can be useful for future technology evaluations and implementations.

In August 2012, UCB CellScope team member Dr. Lina Nilsson worked on location with Vietnamese medical doctors to roll out the study and introduce 15 CellScopes to point-of-care clinics. In Berkeley, team members Clay Reber, Neil Switz, and Dr. Mike D'Ambrosio developed hardware and software solutions for pathogen identification, data handling and study monitoring and evaluation.

The USAID Vietnam Mission has provided the CellScope team with connections to other TB initiatives in northern Vietnam. Such contacts, and the insights that can be shared on technical,

medical, logistical and political considerations, are invaluable and need to be established early in field-testing planning.

Future Plans. The team of Vietnamese collaborators is continuing on-site assistance and evaluation throughout the fall, with weekly San Francisco-Hanoi conference calls and bidirectional update reports. New team member, Vietnamese-speaker and Blum Center undergraduate Anh-Thi Le will participate in a UCB follow-up visit planned for the end of this year. In addition, the UCB team is also continuing the development of novel CellScope platforms.

SDS Interactions with USAID Missions and Technical Staff

Overview. Over the last several months, the Blum Center SDS team has worked with the USAID S&T Office to explore how university-based projects can connect to USAID Missions and their in-country partners. This is useful not only for the SDS collaborative agreement but could also help inform decisions for USAID's HESN initiative. How can universities and Missions effectively support each other with resources and expertise? How can universities meaningfully and directly contribute to, and indirectly reinforce, the goals of Missions without unduly imposing a management burden?

In addition, the USAID S&T Office has facilitated access for the SDS team to technical staff at the Agency. For example, the TIER group has interacted extensively with the Global Broadband Initiative.

Keystone updates. With facilitation and guidance by the S&T Office, the Blum Center and its Innovation Initiative teams have begun exploratory discussions with several USAID Missions and technical staff:

Vietnam Mission. Two in-person meetings, one with USAID S&T Office calling in.
Colombia Mission. In-person meeting, with USAID S&T Office calling in.
Indonesia Mission. Conference call, with USAID S&T Office also calling in.
Mozambique Mission. Conference call, with USAID S&T Office also calling in.
USAIDs Global Broadband Initiative (GBI). Two conference calls with Darrel Owen, the GBI's senior ICT advisor, one with USAID S&T Office also calling in.

These initial contacts have led to further connections, recommendations and actions, as outlined below.

Broad lessons learned and recommendations. Already, the interactions with missions have been a great resource and learning tool for the Blum Center and its Innovation Initiatives. Knowledge of and access to the specific Missions that have S&T Officers, AAAS Fellows, or general interest in exploring university-contacts would be very beneficial as we move forward.

DevTech Index / Catalogue. One challenge identified by Mission teams is quite fundamental: how can they even learn about the various development solutions that universities are working on? A living electronic resource, with short descriptions of technologies and solutions would be useful to

USAID Missions and their in-country contacts as they identify needs and develop initiatives. We suggest that the S&T Office should explore if projects associated with HESN centers could be required – with university projects more broadly invited and encouraged – to submit their projects to such a database. The structure and content could be modeled after the WHO's yearly "compendium of new and emerging health technologies," redesigned for broader applicability.

HESN Field Connector / Project Mapper. Many of the immediate field-work concerns of Innovation Initiative teams were shown to be operational logistics, such as getting US and in-country human-subject research study approvals (IRBs), importation and tax logistics for technology shipments, visas and permits, and so on. The Missions consistently had valuable suggestions of other US researchers working in-country who have recent and applied experience in study logistics as well as in the broader challenges of implementation and evaluation. We again suggest that projects associated with HESN center could be required – and university projects more broadly invited and encouraged – to submit their projects to a geomap-based project listing. Such a resource could be built on the concept of ngoaidmap (http://ngoaidmap.org/), but tailored to addressing the specific needs of university-based research and scaling projects.

UC Berkeley Student Skills Survey. In addition to contacts with PI-led field-based research projects and scaling initiatives, USAID's engagement with universities could also enable direct leveraging of students. Based on the discussions with Missions, we are now surveying students on the UC Berkeley campus to find out what classes, programs, associations and centers already provide opportunities for students to work alongside NGOs, companies and other external groups to solve real-world problems. This database will provide lessons on the necessary conditions for successful student-Mission engagement and may also provide opportunities for a small pilot-study with a Mission.

Specific lessons learned and future plans for SDS Innovation Initiatives. The Innovation Initiative projects will continue to interact with Missions and their partners as part of their upcoming deployments. In particular, the deployment in Indonesia received valuable advice and connections from the Indonesia Mission that the team is following up on and which will inform the upcoming field-implementation. Similar connections were facilitated in Vietnam. For example, as per the Mission's advice, researchers Paul Barber at UCLA and Roger Linington, UC Santa Cruz have been contacted and have given valuable logistics advice for starting up research projects in Indonesia (for example, shipping through the Embassy APO can help facilitate the customs process). Also stemming from the Indonesia Mission's suggestion, the Berkeley TIER team met with Craig Smith, the founder of the Digital Divide Institute. The organization works on 'Meaningful Broadband' in a range of countries, including Indonesia, and offered invaluable assistance in how to approach regulatory hurdles. The USAID mission staff also highlighted opportunities for collaboration with Indonesian universities, which the TIER group is highly motivated to pursue.

GBI and TIER have had many calls and many email exchanges to brainstorm and refine collaboration opportunities on our wireless & mobile communications and renewable energy technologies. GBI has given valuable insight into mobile operators' plans, equipment, and views on technologies like OpenBTS that the Berkeley TIER team is using, and also provided many white papers and reports from GBI's past efforts in countries like Vietnam and Mongolia. The Berkeley TIER team and GBI

have come up with a list of 10 areas of mutual interest that Darrell Owen from GBI is shopping around; a possible opportunity has also been identified for a local startup founded by TIER graduates to tune their technology for rural long-distance broadband connectivity that could be piloted and then scaled up with GBI.

50 Scientific & Technological Breakthroughs Required for Global Development

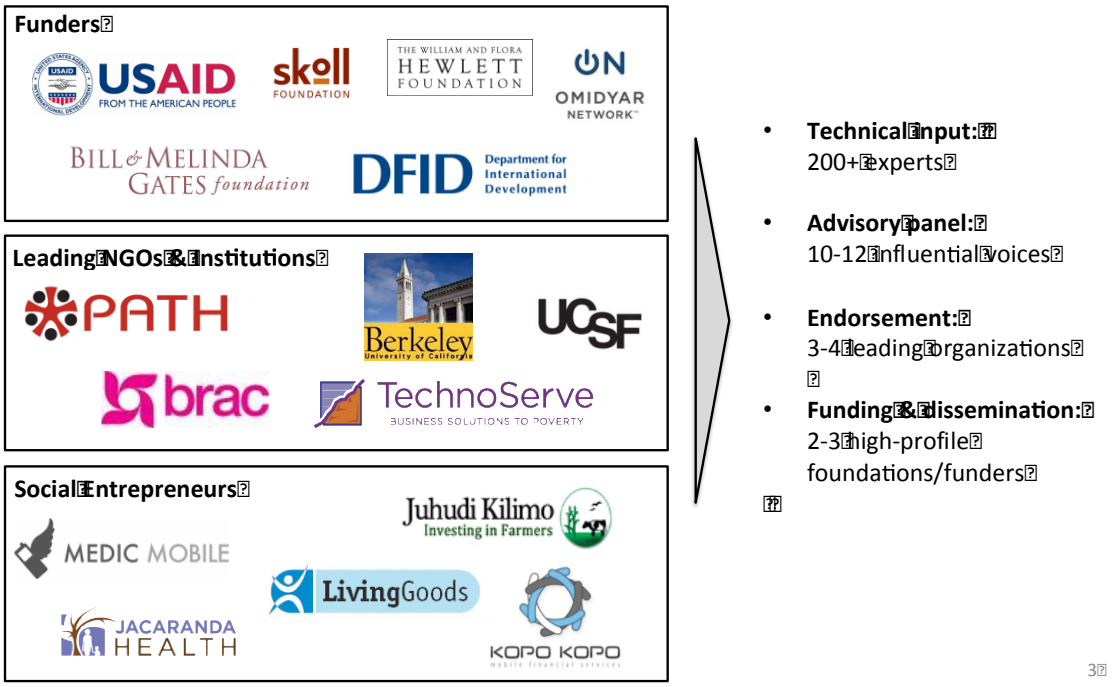
Objective and approach. The core objective of this initiative is to coalesce and catalyze the global ecosystem of innovators on how science & technology can alleviate global poverty and related social ills. We identify pivotal breakpoints which can be addressed by technology-based solutions, assess how current-generation technologies are equipped to address those problems, understand what new breakthroughs are required, and importantly, determine the hurdles to large-scale deployment and adoption. We are focusing on the eight core areas shown in the exhibit below, along with four cross-cutting areas. The core areas are: (1) Food Security, Agriculture & Rural Poverty; (2) Urban Poverty; (3) Health, Water & Sanitation; (4) Education; (5) Governance, Rule-of-law & Human Rights; (6) Recovery from Environmental Damage, Natural Disasters & Conflict; (7) Household Quality-of-life; and (8) Low-carbon Pathways to Workplace Productivity. The cross-cutting areas are: (a) Empowerment & Inclusion of Women; (b) Energy Production & Storage; (c) Water Security & Access; and (d) ICT.

Progress to date. The project was launched in mid-July. Since then, we have been conducting literature research and expert interview deep-dives in many of the areas, with focus on four of them: Health, Water & Sanitation (we have covered maternal health, neonatal health, tuberculosis, and diarrheal diseases related to water/sanitation; our desk analysis of HIV/AIDS, malaria, and diabetes is underway); Education (primary, secondary, vocational/technical); Water Security & Access; and Food Security, Agriculture & Rural Poverty. The exhibit below shows the progress in each of the areas. We plan to interview a total of about 200 experts (between 5 and 25 per topic, depending on its complexity); to date, we have interviewed 5 experts in Education, 25 in Health, Water & Sanitation, 6 in Agriculture, and 10 in Water Scarcity & Access.

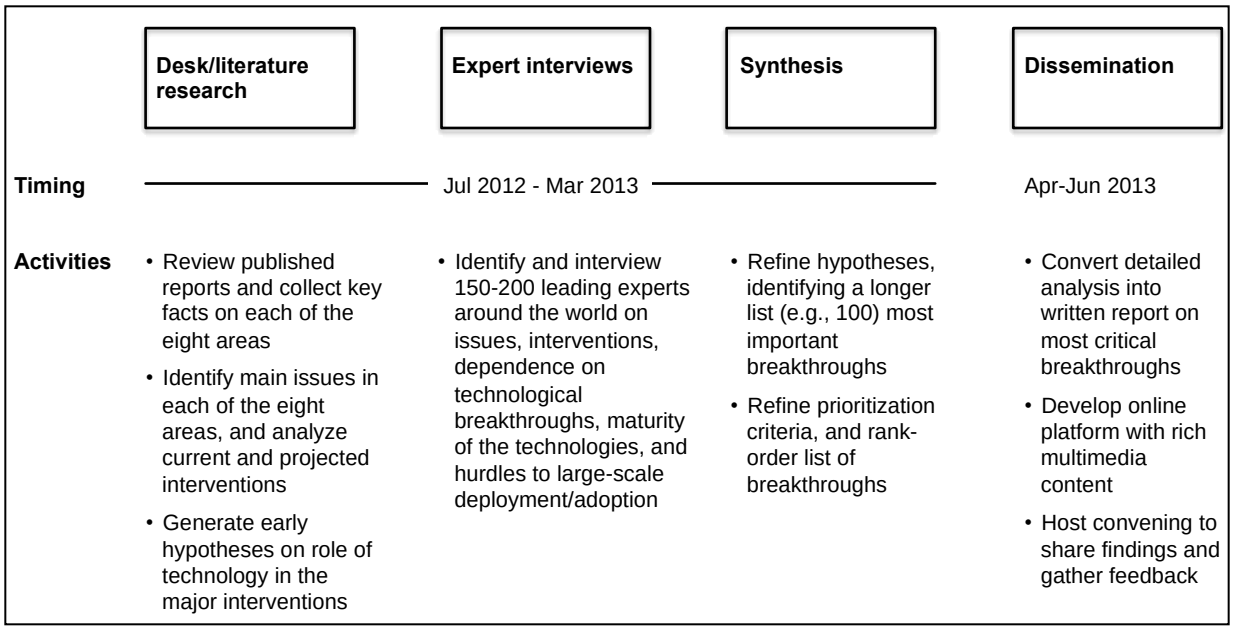
We have begun to identify key issues and breakthroughs. As an illustrative example, in Neonatal health: 3.3 million infants die each year, due to a range of problems such as infection, pre-term complications and asphyxia. As with maternal mortality, the general root cause is a severe lack of access to trained clinicians and adequate facilities. Even as the broader clinical ecosystem develops, technologies such as *low cost modular incubators* (including warmers, lighting and continuous positive air pressure machines), along with effective *sterilization* mechanisms can reduce neonatal mortality, especially in cases of preterm birth and respiratory distress. In addition, a *rapid point-of-care diagnostic for localized maternal infections* (such as Group B Streptococcus) can allow for treatment immediately prior to birth and dramatically reduce early

Engaging the ecosystem. To achieve our objectives, it is essential to engage the ecosystem, soliciting input and guidance throughout the process from actors in three main groups: influential funders (who can set the agenda), leading research institutions and NGOs (who can develop and deliver the breakthroughs), and innovative social entrepreneurs (who push creative boundaries). We will work with these actors to ensure the content is widely disseminated (and utilized). We will

also ensure that numerous experts in the R&D and international development arenas vet the content. We will have an advisory panel of 10-12 leading voices in the field, and will consult about 200 content experts. Thus far, we have enlisted 5 advisory panel members, and have interviewed more than 30 technical experts.



Next steps. As illustrated in the following exhibit, our team will continue rigorous desk research and analysis in remaining areas, and connect with and interview hundreds of expert across subject areas to validate content, analysis, and findings. Upon completion of these two phases, our team will move to final synthesis and validation processes, leading eventually to publication in partnership with a few key organizations.



Big Ideas@Berkeley Competition

Background. Managed by the Blum Center, Big Ideas@Berkeley is an annual innovation contest aimed at providing funding, support, and encouragement to students who have creative solutions to challenges facing our campus, community or world. This year up to $300,000 in prize money is available to students across nine categories. The goals of the contest are as follows:

1. Challenge students to step outside of their traditional academic boundaries and empower them to conceive creative solutions to social problems.
2. Provide critical resources to support students in thinking about the design, implementation, and impact of their projects.
3. Harness the power of student innovation into scalable and sustainable social ventures with real world impact.

2012-2013 Big Ideas Timeline

09/04/12 Contest Launched

11/06/12 Pre-proposal Deadline

12/04/12 Finalists Announced

Overview of Recent Developments. Over the first six months of the USAID/Blum Center Collaborative Agreement, we made progress toward achieving three goals. First, we developed new contest categories with input from USAID and UC Berkeley faculty experts. Second, we conducted research on existing student innovation incubator models and administered surveys to past Big Ideas winners to better understand the resources and services that are necessary to nurture and launch student ventures. Third, we have begun developing a toolkit ("Big Ideas in a Box") that outlines our lessons learned in developing the contest and provides a roadmap for other campuses within the HESN network to follow when launching a Big Ideas Contest of their own.

New Big Ideas Categories. We launched two new Big Ideas Contest categories that confront similar issues being addressed by USAID's "Grand Challenges for Development." These categories were developed with input from USAID's Grand Challenges team as well as experts on the UC Berkeley

campus. The *Promoting Human Rights* category (http://bigideas.berkeley.edu/contest/rights/) seeks novel ideas that address the causes or consequences of corruption and/or promote the protection of individuals' essential human rights. The *Maternal & Child Health* category (http://bigideas.berkeley.edu/contest/maternal/) seeks innovative solutions to safeguard the health of expectant mothers and young children.

Incubation Research and Strategy. Through its collaboration with USAID, Big Ideas@Berkeley is designing a model to accelerate the development of student-led social ventures. To better understand the landscape and what is needed by students, a graduate student researcher is currently analyzing surveys of past Big Ideas winners, researching existing incubator programs, and reviewing literature on incubator models. This will give us the critical data we need to: a) understand the most sought after types of resources and services required by student innovators, and b) develop an incubator strategy for Big Ideas winners that is unique and adds value, rather than simply replicating resources that can be found elsewhere. We expect to present this research at the USAID/Blum Center technical convening meeting that will be held in early 2013.

Big Ideas Roadmap. The Big Ideas model empowers students to create social change, and in an effort to assist other campuses in harnessing the power of student innovation, we plan to share our replicable model with other universities, such as those in the HESN network. To meet this goal, the Blum Center is currently working to develop a replicable model for the Big Ideas Contest, with the intention of developing a roadmap that can be used by other universities, most notably those in the HESN network. We have developed an outline (see Appendix A) and are in the process of completing sections as we move through the various stages of the 2012-13 Big Ideas contest. In addition to providing a stage-by-stage roadmap for launching a Big Ideas competition, we are incorporating "lessons learned" and a "toolkit" that provides sample resources that can be accessed by future partners (e.g. publicity materials, survey questionnaires, mentor and judge recruitment materials, among others).

Sample New Initiatives for Spring 2013

Revealing Demand Conference

The SDS team is in the process of laying the groundwork for a conference on "Revealing Demand," to be held at UC Berkeley in Spring 2013. The conference will serve as a forum for technologists, applied researchers, funders, and policymakers in developing countries to discuss new tools and approaches for more accurately understanding the preferences, demands, and needs of the poor.

Over the past six months, the SDS team has held meetings and phone calls with academics and USAID staff to discuss the motivation and goals behind the conference. Though we initially planned to hold the event in Fall 2012, we have revised our timeline to allow for a more thorough assessment of key stakeholders, relevant case studies, and existing tools and approaches, which we believe will contribute a great deal to the discussion. In advance of the conference, we hope to circulate a White Paper to provide background reading and stimulate brainstorming on the topic.

The event itself will discuss numerous case studies of technology deployments in developing

countries, with a particular emphasis on those that have failed to achieve adequate adoption and impact. Further, we will explore behavioral mechanisms (including marketing, messaging, and financing) that can be used to propel technologies to market and eventually to scale. Deliverables will include a "toolkit" of best practice methods for revealing demand, as well as a database of case studies on successful and failed technologies, and new research ideas and partnerships among those in attendance (and their partners).

HESN White Paper Series

A series of white papers is being planned, including the following themes:

- Iterative design of technologies for economic development
- Addressing the university "valley of death" in development
- Blum Center methodology (multi-disciplinary education and innovation)
- Supporting student-led innovation for poverty-action
- Use of near-real-time remote/mobile-collected data by development actors for decision-making

Staff Exchange: USAID personnel at UC Berkeley

Background. As part of the Cooperative Agreement between the Blum Center and USAID, we will pilot a professional development program for USAID Mission and Washington staff, not unlike a reverse-IPA, whereby USAID personnel serve in-residence as visiting practitioners at universities. While at Berkeley, USAID personnel will surface issues and problems that need solutions, and provide their real-world expertise to the university community of researchers and students. At the same time, USAID staff will learn about and experiment with new tools and methodologies from their university hosts.

Purpose of Pilot. During the pilot phase, one or two USAID team members would visit Berkeley for 4-6 weeks to work with Blum Center staff to co-design the program.

Components of the pilot. The USAID personnel will take part in a wide-range of technical and strategic events and meetings, including:

- Connect to the Innovation Pipeline projects by attending weekly individual Lab Group Meetings, in addition to meeting informally with other faculty.
- Participate in SuperGroup Methodology Meetings: Attend discussions of faculty, students, and staff scientists from multiple Lab Groups working on common development problems from different perspectives or disciplines to detail the "methodology" for poverty action.
- Participate in USAID-Blum Center weekly calls.
- Join any of the ongoing development seminars, courses, or working groups on campus, and attend campus conferences and events (including small dinners with other visiting fellows, faculty and scholars).
- Serve as Keynote Speaker for Blum Center "Connector Breakfast" a monthly event bringing faculty from campus together who are interested in a topic and might otherwise not know each other – thereby seeding interdisciplinary collaborations.

- Present 1-hour guest lectures in various university-sponsored courses, addressing professional or field experiences, or USAID's programs, challenges, and priorities.
- Hold Office hours for students interested in careers in international development.
- Serve as Mentor to students preparing their Big Ideas @ Berkeley application.

Evaluation. Prior to the pilot program's launch, both Berkeley and USAID staff will outline, in a 1-page concept note, their expectations for the Fellowship experience. These will include measurable outcomes, such as numbers of lectures delivered, or numbers of new partnerships developed. At the close of the pilot phase, we will briefly survey faculty, students, and staff involved in the program for feedback. This will feed into refinements of the future program.

Deliverable. At the end of the four to six week pilot, the Fellows and the Blum Center staff would present the outlines of a Reverse IPA to be advertised broadly across the USAID staff network.

Training and Capacity Building: Student Involvement in SDS

Each semester, the Blum Center is fortunate to work with many talented students at UC Berkeley. Since the Center began in 2006, we have supported over 250 graduate students and 75 undergraduate students who have worked with us as researchers, instructors, designers, writers, peer advisors and office assistants.

Since the start of the USAID-Blum Center cooperative agreement, a number of talented students have supported this new endeavor through diverse channels, ranging from technical work on Innovation Pipeline projects, to support for the Top 50 technologies analysis and graphic design of event posters.

During the Fall Semester 2012, we have been supporting 4 graduate students from diverse backgrounds in engineering and public policy working on overall implementation of the USAID-Blum Center cooperative agreement. The '50 Technologies' project is supported by an additional 2 graduate students. Another 5 graduate students, 2 undergraduate students, and 1 postdoctoral researcher support specific Innovation Pipeline projects through the Blum Center.

Graduate Students working on SDS

- *Evan Axelrad: MPP Candidate, Goldman School of Public Policy (GPP)*
- *Allison Berke, PhD Candidate, College of Engineering, Bioengineering*
- *Tammy Guo, MPP Program, Haas School of Business/GPP*
- *Priya Mehta, MBA Program, Haas School of Business*
- *Dominic Molinari: MS Candidate, College of Engineering, Civil*
- *Erica Schlesinger: PhD Program, College of Engineering, Bioengineering*

Innovation Pipeline

- *Kashif Ali, PhD, Postdoctoral Fellow in Computer Science*
- *Nader Behdin, Undergraduate, Electrical Engineering*
- *Kurtis Heimerl, PhD Program, Computer Science*
- *Anh-Ti Le, Undergraduate, Political Science*

- *Kenneth Lee, PhD Program, Agriculture and Resource Economics*
- *Achintya Madduri, PhD Program, Electrical Engineering*
- *Meena Natarajan, PhD Program, School of Information*
- *Javier Rosa, PhD Program, Computer Science*

Additionally, the SDS team is working to create a Designated Emphasis in *Development Engineering (DevEng)* at UC Berkeley (this is the equivalent of a "Minor" at the PhD level). The DevEng curriculum will prepare graduate students in engineering, development economics and other social sciences to iteratively design and test new technologies for developing countries. A Faculty Advisory Committee led by Professor Clair Brown in the Department of Economics will organize the curriculum and course requirements for DevEng, based on a preliminary list of relevant courses we have already compiled. Professor Brown, whose work focuses on labor market outcomes for the energy and telecom industries, has extensive experience leading inter-disciplinary groups on campus. She is Director of the Center for Work, Technology, and Society and a helped establish a Designated Emphasis in Science & Technology Studies (STS) to train Berkeley PhD students from any department in the social studies of science, technology, and medicine.

Monitoring & Evaluation

The SDS team carefully documents and processes all feedback from USAID (generated during weekly calls), as well as input from network members and partners familiar with our objectives and constraints. Detailed meeting notes and next steps are shared internally using Google Docs. Individual project teams meet regularly to discuss progress, challenges and next steps, sharing documents and providing feedback on work plans using online platforms such as Dropbox and Basecamp. Our participatory approach to performance monitoring and evaluation requires that all staff and stakeholders are aware of agreed upon evaluation methods; as such, we are committed to discussing M&E at all group meetings and to documenting all activities that contribute to project results. Additionally, we prioritize discussion of organizational processes, identification of performance gaps, information sharing, and setting of realistic timetables for goal completion.

SDS Initiative Management

The SDS is staffed by a core group of faculty and staff drawn from UC Berkeley's Blum Center for Developing Economies, the Center for Effective Global Action, and the Department of Electrical Engineering & Computer Sciences. PI Shankar Sastry continues to be responsible for coordinating the activities and monitoring the overall workplan, with significant input from faculty and staff. Financial accounting responsibility rests with UC Berkeley's Engineering Research Support Office, namely Ms. Gladys Khoury. The UC Berkeley Office of Sponsored Projects also is an important actor in this Cooperative Agreement.

Each week, usually on Tuesdays, the core team meets telephonically. This weekly conference call of the working team allows for both project management updates and technical subject matter discussion. Project management updates include prioritizing deliverables and adding subcomponents of each process as needed. The technical subject matter discussion focuses on field work – ranging from administrative matters pertaining to connecting to the appropriate USAID

mission staff to engineering related issues related to the research. Each week, conference call participants report on progress towards deliverables and adjust priorities as the workplan proceeds. Participants include a range of personnel from UC Berkeley and the calls are chaired by USAID's Maurice Kent. We have found this series of regularly scheduled calls to be very useful for monitoring progress, assessing next steps, and coordinating activities across the various deliverables. We suggest that future HESN partners include this regularized check-in as a core component of their cooperatives agreements.

To date, we have built a tremendous network of domestic and international partners working on technology for development, including academic institutions, NGOs, research implementation organizations, start-ups, investors and other key stakeholders. These partners have a wealth of experience designing, deploying, evaluating, and investing in the scale-up of promising technologies in developing countries; they are well-respected in their sectors. Ongoing outreach activities range from assessing potential partnership and leverage opportunities to soliciting feedback on actions and next steps.

See Table 1 below for a breakdown of domestic and international partners who have already contributed in measurable ways to the SDS initiative (i.e. providing input on program design, suggesting ways to prioritize innovation and research, and committing in-kind and financial resources through letters of support). We will draw from this diverse network of partners when assembling our External Advisory Board, which we expect to do in January 2013. Additionally, we expect research relationships to form between those academic, NGO and industry partners within our network, resulting in a host of new "test cases" that will contribute directly to the development of our approach to iterative design.

Table 1. SDS Partners by sector (domestic and international)

Type	**Domestic**	**International**	**Total**
Academic	23	8	31
Industry	14	5	19
NGO	2	2	4
Implementation	1	2	3
TOTAL	**40**	**17**	**57**

Appendix A

Big Ideas in Box

DRAFT Table of Contents

1. Big Ideas@Berkeley mission and vision
2. Overview of the history of Big Ideas@Berkeley
3. Overview of the 2012-13 Big Ideas@Berkeley Contest
4. Staff roles and responsibilities
5. Developing category descriptions
6. Developing sponsorships for categories
7. Student application process
8. Judging
    a. Recruitment
    b. Training
9. Mentorship
    a. Recruitment strategies
    b. Mentor and student team matching strategies
    c. Mentorship worksheets from the 2012-13 Big Ideas@Berkeley Contest
10. Resources for students
    a. Writing workshop materials from the 2012-13 Big Ideas@Berkeley Contest
    b. Information session materials from the 2012-13 Big Ideas@Berkeley Contest
    c. Office hours strategies
    d. Next step: incubation resources
11. Marketing
    a. Marketing strategies, including social media strategies
    b. Branding strategies
    c. Marketing materials from the 2012-13 Big Ideas@Berkeley Contest
12. Online resources
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    b. Website
13. Soliciting feedback for continued improvement
    a. Evaluation
    b. Steering committee
    c. Student advisory committee